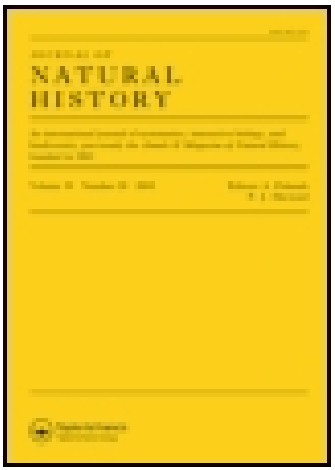

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L.—On Coccoliths and Rhabdoliths

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3. *Sphærotherium fraternum*, n. sp.

Closely allied to the preceding, but with head and nuchal plate coarsely punctured all over and clothed with short hairs, the dorsal segments exhibiting a number of small, rounded, whitish pustules.

Length 8½ lines; width 5 lines.

Hab. Victoria, Australia (*Dr. Howitt*). One specimen. B.M.

4. *Sphærotherium nigrum*, n. sp. Pl. XVIII. fig. 11.

Shining black, antennæ clothed with reddish hairs.

Head glabrous, coarsely and densely punctured in front, sparsely behind; nuchal plate delicately rugose and coarsely but sparsely punctured; dorsal segments coarsely rugose and punctured, last segment densely punctured, its outer edge curving outwards so as to form a distinct projecting rim; lateral wings very slightly curved.

Length 1 inch 4 lines; width 8 lines.

Hab. South Africa (*Sir Andrew Smith*). One specimen. B.M.

A remarkable species, coming nearer to *S. grossum*, Koch, than to any other described form.

5. *Sphærotherium sinuatum*, n. sp. Pl. XVIII. fig. 10.

Closely allied to *S. dorsalis*, Gervais (*Zephronia pulverea*, White; *Sphærotherium retusum*, Koch), but smaller, without dorsal ridge, the punctuation of the head and nuchal plate finer, the lateral segmental wings curving distinctly backwards, and the depression of last segment reduced to a slight sinus.

Length 7½ lines; width 4 lines.

Hab. Sarawak (*Wallace*). One specimen. B.M.

L.—*On Coccoliths and Rhabdoliths.* By Oscar Schmidt*.

[Plates XVI., XVII.]

I must preface my communications upon Coccoliths and a newly discovered kind of organized corpuscles from the *Bathybius*-mud, which I call Rhabdoliths, with a short report upon the course of that expedition in the lower part of the Adriatic Sea during which I first made a close acquaintance with these exceedingly remarkable corpuscles.

By working up the sponges captured during the sounding and surveying of the Florida coast, and incited by the English

* Translated by W. S. Dallas, F.L.S., from the 'Sitzungsbericht der k. k. Akad. der Wissenschaften in Wien,' Bd. lxii. (1870) Abth. i. pp. 669–682.

deep-sea soundings, the desire was raised in me to learn more accurately the conditions of the bottom of the Adriatic. My frequent dredging-voyages along the Dalmatian coast had hardly made me acquainted with a greater depth than from 40 to 50 fathoms. In presence of the surprising results of the investigations of the Atlantic sea-bottom, and their importance equally in zoology and geology, a supplemental examination of the sea near me appeared to be of general interest. But it was perfectly clear that this could only be undertaken with large resources; and for this purpose circumstances were peculiarly favourable. Considering the total deficiency of modern and fully trustworthy charts of the Adriatic Sea, a thorough survey of it could no longer be put off. This great work was confided by the Admiralty to Captain Œsterreicher with a number of officers. A smaller steamer was associated with the principal ship, the 'Triest,' a large and convenient steamer; and besides its rowing-boats the 'Triest' carried a steam-launch. As in the summer of 1870 it was proposed to lay down some lines between the Apulian and the Albano-Dalmatian coasts, I applied to Vice-Admiral von Tegetthof and Captain Œsterreicher, and received from them the most obliging permission and invitation to pass a few weeks with my friend Professor Gobanz as a guest on board the 'Triest,' and a promise that I should be as far as possible aided in my designs. Equally liberal was the assistance of the Imperial Academy with regard to our equipment. And so my companion and I found ourselves with the Lloyd's steamer, on the morning of the 20th of June, in the roads of Durazzo, where the 'Triest' was lying at anchor. We were cordially received by the gentlemen of the surveying-expedition, and I look back with pleasure and gratitude to every hour of my living in their company.

I had had dredges made upon two models:—one the frame of which was a narrow rectangle; and several with triangular frames, of which I have previously made use with good results. The only improvement (to which Professor Lovén had called my attention) was, that of the three bows which bear the ring for the rope, only two are riveted together, whilst the third is united with them by a somewhat thinner piece of rope. In the event of the catching of the dredge, this union will break more easily than the hawser, and the dredge will be more easily freed. I was never in a position to learn this by experience. The triangular dredge proved perfectly available down to depths of 630 fathoms, the greatest that we attained, when leaden weights of 80 lbs. were attached in the angles. As a tow-line, rope of the thickness of one's thumb was used; and in the absence of a small steam-engine for drawing it up,

the numerous hands of the crew proved to be more than sufficient. During the operations with the dredge, the soundings and measurements of temperature were also carried on. With regard to the temperatures, I have as yet seen no connected series; but this portion of the operations of the survey will be worked out by Lieutenant Weyprecht. In the deepest parts of the gulf, with a surface temperature of 18° R., the temperature does not fall below 12°–10° R., so that these differences can hardly have any essential influence upon the development or repression of life. Moreover in the basin-like part of the Adriatic Sea in which we made our observations, the currents are remarkably small, and do not appear to affect the greater depths of several hundred fathoms. I place the extraordinary poverty of those deeps in all the higher forms of life chiefly to the account of this circumstance. On the upper parts of the Dalmatian coast, where the gulf is more narrowed, the shore-current is more perceptible, and the position of elongated islands and groups of reefs (*Scoglien*) gives origin to stronger local currents; it is precisely these regions that are endowed with the richest fauna and flora. As both Heller and myself ascertained, this abundance diminishes towards Ragusa, and below this point the coast is almost entirely sterile. On board the 'Triest' I investigated three lines with the dredge, namely Sasano-Brindisi, Bari-Durazzo, and Dulcigno-Viesti. The greatest depth of the first line was reached with 480 fathoms, and that of the third with 630 fathoms. The dredge could be so often cast, and, notwithstanding its simplicity, acted with such certainty, that from its contents a tolerably correct picture of the nature and population of the bottom must result. The first freshly examined sample of the bottom from 170 fathoms convinced me that I had *Bathybius*-mud before me. Its yellowish-grey colour and its exceedingly characteristic greasy nature were so well known to the officers that I was unanimously assured by them that this "primitive mud" predominates from the upper parts of the Adriatic Sea, alternating only here and there with a few extended sandy tracts. The soundings of previous years have confirmed this; and in like manner the dredge constantly brought me up this mud from all depths on all three lines. It was immediately seen that it is extremely rich in Foraminifera (predominantly *Globigerina*, *Orbulina*, *Uvigerina*, *Rotalia*, *Textularia*); but I looked in vain for other things which I had expected to find. A young and consequently not quite certainly determinable specimen of an *Echinus*, probably *E. melo* (= *Flemingii*?), from 230 fathoms, and an empty but perfect shell of *Terebratula vitrea* from 430 fathoms is the entire produce! That from the

same depths some very young Bivalves, of scarcely ¾ millim. in diameter, made their appearance, whilst no trace of full-grown animals was to be found, can only be explained by the supposition that the larvæ furnished with their velum were driven unusually far into the open sea.

I turn now to the *Bathybius*-mud and the coccoliths. Very soon after my return, I published in the 'Ausland,' No. 30, a short notice of the discovery of these bodies at all depths in the Adriatic Sea, from 50 fathoms downwards, with the addition that they would no doubt be present also at less depths. I was consequently in advance of the publication of the extended investigations and discoveries of Gümbel, as he explained in No. 32 of the same journal. We have now a more detailed statement of these fine observations*, which show the extraordinary diffusion of *Bathybius* and the coccoliths in all depths of all seas of the actual world, and the colossal part taken by them in building up the crust of the earth. I had also already made the discovery that the coccoliths are strongly represented in the raised land of Brindisi. Now, as Häckel also nearly at the same time investigated the coccoliths with his usual thoroughness†, it might seem to be superfluous for me to go into the same subject.

But as Gümbel's work, so far as it is at present before us, extends only to the demonstration of the presence of coccoliths in the most various calcareous and marly deposits and in the sediments of the present day, and to certain reactions of *Bathybius*, and as I am obliged to conceive the structure of the coccoliths differently from Häckel in several points, and, finally, as, from the almost inconceivable importance of the coccoliths, any contribution to their more accurate knowledge must be welcome, the present memoir will carry with it its own justification.

I will first of all deal with a statement of Gümbel's, "that it is certainly conceivable that *Bathybius* takes its origin in the sarcode of the lower animals." He is led to this by the observation, "that when the shell of calcareous-shelled Foraminifera is dissolved away by dilute acid, their punctate membranes and granular flocks remain undissolved in the residue, which latter possess the form and reaction of *Bathybius*. These remains, indeed, may just as well be the residue of the sarcode of the Foraminifera as of our *Bathybius*, which had only been deposited in the cavities of the Foraminifera, and in this way comes again into view." The sarcode of the Foraminifera will

* Gümbel, "Vorläufige Mittheilungen über Tiefseeschlamm," N. Jahrb. für Mineral. &c. 1870, Heft 6.

† Häckel, "Beiträge zur Plastidentheorie," Jenaische Zeitschrift, v. 3.

very probably exhibit the same reactions as the protoplasm of *Bathybius*; so that I should by no means be inclined to deduce the identity of the two bodies in other respects from such a resemblance. But even before I had read Gümbel's communication in the 'Jahrbuch' it was known to me, by direct observation, not only that empty shells of Foraminifera are filled by *Bathybius*-mud, but *also that living Foraminifera incept* Bathybius-*flocks together with coccoliths, no doubt as nourishment.* The derivation of *Bathybius* from Foraminifera and other Protista is quite inconceivable when we consider the quantitative proportions. If we wash and strain off several pounds of Adriatic *Bathybius*-mud, there remains a minute heaplet of Foraminifera. And, further, the *Bathybius*-protoplasm, if supposed to originate from Foraminifera, would necessarily become decomposed before it could collect into such incalculable masses. *Bathybius* freshly taken out of the sea exhibits very sluggish movements, more sluggish even than those which occur in the sarcodic net of most sponges, but in other respects exactly the same phenomena which may be detected in specimens preserved in spirits of wine. This agrees exactly with my numerous comparative observations of fresh sponges and sponges preserved in spirit. Preparations of the finest sarcodic nets derived from the latter are absolutely undistinguishable, if we leave out of consideration the sluggish displaceability, from fresh preparations just taken out of the sea. I believe, therefore, that the further observation of the living *Bathybius* will furnish no particular information as to its nature.

At present the coccoliths seem to be inseparable companions of the *Bathybius*-protoplasm. It is a very different question, however, whether they merely live upon the soil of this protoplasm as independent organisms, or are products of it, as parts or organs. In what follows, an interpretation will come out, according to which the coccoliths pass through an independent cycle of development.

Both Huxley and Häckel admit that there are two different, although nearly allied, forms of coccoliths—namely, a simple disciform kind (the discoliths), and another which presents the form of a double disk united by a central pin (the cyatholiths). I must decidedly affirm that this distinction does not occur, and *that rather all those forms which Häckel has described as perfectly developed discoliths with an outer ring are cyatholiths*—in other words, that the outer ring is nothing but the margin of that shield which in the cyatholiths stands out better, from its somewhat greater removal from the other parts. Thus I have met with no supposed discolith the margin of which could not with patience be ascertained to be a constituent of

an entire disk. I beg the reader who may have Häckel's work at hand to compare figures 25 (discolith) and 72 (cyatholith). Both, when looked at from the surface, have the same appearance; and even in 72, *e*, the margin of the larger disk appears, like *e* in 25, as the outer ring. If 72 when placed on the edge appears like figs. 33 and 62, whilst 25 in the same position gives an outline like fig. 44, this is due solely to the fact that in the latter case the inner circle and disk are completely concealed by the outer basin-shaped shield.

I desired at the beginning to call attention to this important point, as it essentially simplifies the question as to the structure of the coccoliths; and I will now pass to the special examination.

In Pl. XVI. fig. 15 a coccolith is shown from the flat or ventral side. The individual parts are named as follows by Häckel:—*a*, central granule; *b*, medullar space (*Markfeld*); *c*, medullar ring (*Markring*); *d*, granular ring (*Körnerring*); *e*, outer ring. I must remark that only in rare cases have I seen the medullar ring otherwise than as in my drawing and as Häckel figures it. It appears to me almost without exception as the simple contour of the medullar space, and only becomes more shaded when the medullar space acquires a more concave form. We now first trace the coccoliths to the development of the granular ring, which frequently becomes a *granular disk*. Numerous corpuscles with a simple or double contour, and from 0·001 to 0·004 millim. in diameter, appear as isolated central granules and as central granules with the medullar space (figs. 1, 2). The most important stage, however, in the development of the coccolith is that of the formation of the granular ring. Häckel characterizes this simply as a granulated zone; and, according to his figures, the material examined by him was already so much altered that the composition of the granular ring of actual spherical portions did not distinctly appear. Bodies like fig. 3 of our plate are not unfrequent. It consists of a lenticular central part, with a ring of from 7 to 10 balls. Häckel also has a similar structure in his fig. 10, which, however, according to his statement, consists of merely sarcodic granulations. The bodies of which I am speaking are solid, but may certainly have proceeded from a sarcodic foundation.

Although we may remain in doubt as to this category of corpuscles, this is no longer the case with another very frequent form. In fig. 4 we see the central granule and medullar space surrounded by a distinct circlet of balls; and from a comparison of a great number of specimens and stages, it appears that this ring of globules originates in a growth and subsc-

quent division of the margin of the medullar space. The margin of the medullar space swells up; and such specimens as fig. 5 show that the marginal swelling is not formed uniformly, and only by degrees constitutes a perfectly closed circlet. Almost without exception, the whole structure, at the appearance of the circlet of balls, acquires the form of a bowl, at the same time that there is the greatest variability in the number of the globular portions and the size of the individual globules.

In two cases we have nothing more formed than a mere zone of globules or granules. This is shown in figs. 6, 7, 9, 10, 11. One case is, that only a circle of large globular portions surrounds the medullar ring. A very frequent case of this kind is shown by fig. 6, from the fresh *Bathybius*, and fig. 9, from the raised deposits near Brindisi. It is true, as I shall show hereafter, that here also completion may be effected by the outer ring, *i. e.* the dorsal disk; but in general the development of the body seems to be closed with the growth of the large globular portions; and I have no indication that these large globules break up into smaller portions. Such bodies as fig. 11 are excessively rare. It shows, in the circumference of the central disk, a circlet of large celliform balls; and this body also occurs but little altered in the deposits at Brindisi (fig. 10). The centres in the globules of the circlet appear quite distinctly to be condensed into a sort of nucleus, which also makes its appearance quite definitely, although irregularly, in the specimen from Brindisi.

In the second case (fig. 7) we find, instead of a simple circlet of globules, a granular zone, *i. e.* a zone in which small globules of about the diameter of the central granule are placed in from 2 to 4 rows side by side and partly over one another. Both this and the above described body may, as we show further on, cover themselves with the dorsal shield; but frequently this course of further development does not occur, and bodies are produced like fig. 8 and, more distinctly, fig. 12; they are hemispherical. In fig. 12 we are looking into the sphere; fig. 13 is the appearance from the side, fig. 14 from behind. Instead of a granular zone, a regular granular mantle is present. I am uncertain about the observation that sometimes an entire hollow sphere is produced. How the division into globular portions is compatible with the not unfrequent concentric striation, is not yet clear to me (fig. 8).

I give on Pl. XVII. figs. 16 & 17 a form of the incomplete coccolith which is not unfrequent. The central granule and medullar space are present, the latter undoubtedly as a disk. There is, however, no medullar ring; but what might be

regarded as such is the actual margin of the medullar space. The granular zone is in course of production, although it does not appear in the whole circumference, but advances round the margin as an excrescence starting from a particular point.

When the development of the coccolith has taken a direction as in fig. 12, Pl. XVI., it appears to be concluded with the granular layer. In all other cases the coccolith usually becomes completed by the formation of a concavo-convex disk, which generally appears homogeneous, rarely irregularly notched and granular, and covers and more or less overarches the parts previously formed. As already mentioned, I have most decidedly ascertained that Häckel's so-called outer ring is never in connexion with the outer margin of the granular zone, but is only the margin of a regular shield projecting beyond the granular zone. In every object that I succeeded in turning and placing on its edge, I was able to trace and ascertain this dorsal shield.

In Pl. XVI. figs. 16, 17, and in Pl. XVII. most of the figures show the character and position of the dorsal shield. In figs. 1 and 2 the case is represented in which the central granule has attained a perfectly excessive development. This may furnish the explanation of a case occurring at Brindisi (Pl. XVII. fig. 18) in which not only is the central granule elevated, but its base and the part representing the medullar space appears granulated. This coccolith is completed by a strong granular ring. In figs. 3 and 4 (Pl. XVII.) the central granule is wanting. All these, and the other figures of discoliths with a dorsal shield (figs. 5, 6, 7, 10, 11, 12, 13, 14, 15), show individually and when compared with each other that in the centre of the convex side of the coccolith the dorsal shield is connected either with the medullar space itself, or with a peg-like prolongation of the part corresponding to the central granule. In the fresh state their union seems to be so firm, and perhaps elastic, that the dorsal shield is scarcely ever broken away. From the deposits at Brindisi, however, I have repeatedly obtained coccoliths like Pl. XVII. fig. 19, with a regular aperture in the centre of the medullar space, which I imagine to have been produced by the breaking away of the dorsal shield together with its pin.

From all these observations, therefore, the dorsal shield cannot be otherwise produced than by its gradually overgrowing the other parts from the dorsal pole of the coccolith. The observation of such intermediate stages is extremely difficult, because, up to the period when it projects beyond the circumference of the granular ring, it appears to adhere closely to the dorsal surface in the form of a most delicate lamella.

Pl. XVII. fig. 13 shows a coccolith from the dorsal side, and how the granular zone projects beyond the somewhat irregular outlines of the shield. A monstrous shield-formation may, however, occur, as in Pl. XVII. figs. 8 and 9, in which one half of the shield is completely adherent, whilst the other has grown out like a tongue. Rarely the margin of the shield is notched and so swelled as to resemble the margin of the granular zone, as in fig. 5.

We come now to a very important, and, it seems to me, quite unsettled question, namely that of the relation of the coccoliths to the *Bathybius*-protoplasm. Are they independent organisms? or are they organs or parts of *Bathybius*? In other words, do they propagate themselves by passing through a definite cycle of development, in which the *Bathybius*-protoplasm serves them as a soil? or does their formation occur as particles of the protoplasm? In the first place we have to examine whether the doubling of the central granule, with division of the surrounding parts, which is represented by Häckel in a series of figures, leads to any reproduction. Häckel simply states the fact, and says only that the elliptical discoliths are often distinguished by having a double central granule. But the importance of the central granule seems to be by no means great, as it is frequently wanting in otherwise perfectly regular and well-developed coccoliths. Many corpuscles with fissional processes or doublings occurring in *Bathybius* are either decidedly of a different nature or at least doubtful. Thus Pl. XVI. fig. 24 may be an Alga, and fig. 19 perhaps an Alga, but might also be a double central granule with a correspondingly divided medullar ring. With regard to corpuscles such as fig. 18, with a clear centre and turbid periphery, if we consider them isolatedly, we can scarcely make any supposition; but compared with the not unfrequent stages of coccoliths like fig. 20, they might be brought into connexion therewith. As we may ascertain by placing it on its edge, Pl. XVI. fig. 20 is a decided coccolith with a perfect dorsal shield; the dark non-granular part represents the granular zone, and the clear spaces in it a divided medullar space without central granules. Pl. XVI. figs. 22, 23, is unique in my knowledge. The structure and size leave no doubt that it is a coccolith; but the development in height is quite unusual. The dorsal shield has become a capsule open above; and the two central granules appear deeply immersed in it.

When I grasp the impression produced by numerous observations, compared with the facts of the reproduction of other low organisms, *the coccolith appears to me to be an independent living creature.* That *nutrition* and *growth* are performed by

the central parts, the *granule* and the *medullar disk*, appears undoubtedly from their arrangement and the connexion of the other parts with them. The *dorsal shield* is nothing but a *covering piece*, and, notwithstanding its extent, of subordinate importance. In the globular and *granular zone*, however, I see the *reproductive apparatus*. In favour of this there are several reasons. So long as, like the previous observers, we discovered in the granular zone only quite indefinite granulations, the question as to the significance of this part of the coccolith could hardly be raised; but by the present investigation the granular zone must be placed in quite a different light. That the formation of the coccoliths starts from corpuscles which vary in form and size exactly like the globular and ellipsoidal portions of the granular zone, is easy to observe. Exactly the same scope that we see in the foundations of the coccoliths is repeated in the dimensions of the parts of the granular zone, from the small globules like those we find in coccoliths such as Pl. XVI. fig. 15, to the large lenticular bodies in fig. 11. The former are isolated as central granules; the latter appear as central granules with a medullar space. An intermediate step is formed by the globule in Pl. XVII. figs. 1 and 3; and their perfect picture is the central globule in Pl. XVI. fig. 3. The extraordinary variability of the mature coccoliths will therefore be in accordance with an equally wide scope in their foundations; and the multifarious forms of the coccolith-cycle, still by no means exhausted by Häckel and myself, prove (notwithstanding the identity of discoliths and cyatholiths) that we have to do with nothing less than a fixed species. But when we have once accepted the notion that the corpuscles of the granular zone are the spores of the coccoliths, the appearance of many coccoliths is explained by it, as, for example, Pl. XVII. figs. 6, 10, and 14. In fact we often see, instead of the granular zone, which is elsewhere so distinct, an irregular ring or an empty disk-margin. For this I know no other explanation than that the granules have fallen out, leaving behind them that margin belonging to the medullar space from which the growth and production of the corpuscles of the granular zone took place. It is certainly remarkable that specimens such as Pl. XVII. fig. 14 are rare; but they show quite evidently a retrogression and degradation, which is expressed in the brittleness of the central disk and the shrinking of the dorsal shield. It will be objected that this is incompatible with the apparently uninterrupted accumulation of the coccoliths. But in opposition to this it may be said that the fossil coccoliths are still but very little investigated. The form with a finely granular zone (Pl. XVI.

fig. 15), which is so remarkably abundant among living coccoliths, I can hardly detect in the deposits at Brindisi; but it came most prominently into consideration with regard to reproduction. The objection is therefore not serious.

My supposition, however, as to the independence and reproduction of the coccoliths, is established by the discovery of a second corpuscle accompanying *Bathybius*, which is much simpler and clearer, and consequently easier to check in its individuality. It also presents certain points of comparison with the coccoliths. We call it *Rhabdolithes* (Pl. XVII. figs. 20–35). Its first foundation is a little rod, which may be traced of all sizes from 0·001 to 0·005 millim. The developed forms range between 0·0054 and 0·004 millim. in length. Together with the cylindrical rods there occur about an equal number which are thicker at one end than at the other (fig. 22). They then acquire a button-like or globular terminal inflation (figs. 21, 23); and around this is produced a circlet of globules (fig. 24 &c.) which rarely exceed six in number.

The usual form of the fully developed corpuscle is as shown in figs. 31 and 27, the parts of the circlet becoming cylindrical or bacillar; and one can hardly doubt that they are destined to be thrown off for reproduction. In their size and whole appearance they agree with the above-mentioned smallest bacillar corpuscles. Forms such as figs. 29 and 32 are more rare, and are produced, as we may ascertain by turning and twisting the object, by the portions of the circlet being pressed closer together. We may always distinguish in them the individual globular or bacillar parts when we succeed in placing the corpuscle upon the vertex which has no circlet. In the shaft of the larger and especially of the clavate specimens, we observe a fine streak, the indication of a central canal, as appears with certainty from cases such as fig. 30. Not unfrequently also we have forms such as fig. 26, in which the main outline is surrounded by a very pale external contour, and the appearance is produced as if the rod were a larger cavity. Figs. 33, 34, 35 show rare irregular structures. Thus in fig. 33 we see a sprout in the neighbourhood of the non-circleted end; in fig. 34 a piece of the circlet has been produced in the prolongation of the axis of the shaft; and in fig. 35 the circlet has been produced above its usual point of attachment.

In all the samples of mud from the Adriatic which contain *Bathybius* and the coccoliths, rhabdoliths also occur in countless quantities, so that a complete view of them may be obtained in almost every microscopic portion. They are just as well preserved as the coccoliths in the elevated deposits of

Brindisi; and their composition of an organic formation and of carbonate of lime may be demonstrated just as well as for the coccoliths. *Now, if we compare the granular zone of the coccoliths with the circlet of globules of the rhabdoliths, and the central disk (medullar space) of the coccoliths, as the matrix of the globules, with the shaft of the rhabdoliths, and consider that, as I believe I have shown, the dorsal disk or covering piece of the coccoliths is of but little importance, we must recognize the most intimate relationship between these calcareous organisms, notwithstanding their difference of form.* To regard the rhabdoliths as organs or form-constituents of the *Bathybius*-protoplasm we have not the least reason; and thus, it seems to me, the last doubt is removed, as to whether the coccoliths are independent creatures. The two bodies remain no less interesting than they did before, when the coccoliths passed merely as the tokens of the mysterious *Bathybius*. The origin and significance of this latter organic material are still far from being explained. As I have already indicated, it seems to me that the supposition that the *Bathybius*-protoplasm is the residue of other low organic creatures must be completely rejected. It is, however, no Protiston or Moneron in the signification now current, according to which all these simplest organisms have a limitation in space and a development. A living creature of unlimited extension is so strongly in contradiction to our present notions of life and organization, that our conceptions and ideas must first adapt themselves to it.

LI.—*Notice of a new Species of Lizard* (Eumeces albofasciolatus) *from North Australia.* By Dr. A. Günther, F.R.S.

The British Museum has recently received from Mr. Krefft a specimen of a very large species of *Eumeces* from Northern Australia, which appears to be undescribed and may be characterized thus:—

Eumeces albofasciolatus.

A supranasal shield is present, but on one side it is confluent with the nasal behind the nostril; the nostril itself is so large as to be partly formed by the supranasal.

The lower eyelid is scaly. Palate entirely toothless, the palatal notch being considerably behind the level of the orbit.

The single præfrontal forms a suture with the rostral and vertical, which is very long, as long as the occipitals together; a pair of anterior occipitals; central occipital elongate; occipitals bordered behind by four large scales. Nine upper labials, the two posterior low. Opening of the ear not denticulated.